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**BEFORE THE BOARD OF PATENT APPEALS
AND INTERFERENCES**

Application Number: 10/651,459
Filing Date: August 29, 2003
Appellant(s): ELZUR, URI

MAILED
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GROUP 2600

Ognyan Beremski
For Appellant

EXAMINER'S ANSWER

This is in response to the appeal brief filed June 29, 2006 appealing from the Office action
mailed November 22, 2005.

(1) Real Party in Interest

A statement identifying by name the real party in interest is contained in the brief.

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(2) Related Appeals and Interferences

The examiner is not aware of any related appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in the pending appeal.

(3) Status of Claims

The statement of the status of claims contained in the brief is correct.

(4) Status of Amendments After Final

The appellant's statement of the status of amendments after final rejection contained in the brief is correct.

(5) Summary of Claimed Subject Matter

The summary of claimed subject matter contained in the brief is correct.

(6) Grounds of Rejection to be Reviewed on Appeal

The appellant's statement of the grounds of rejection to be reviewed on appeal is correct.

(7) Claims Appendix

The copy of the appealed claims contained in the Appendix to the brief is correct.

(8) Evidence Relied Upon

US 2002/0034182 A1 Mallory 3-2002

US 2003/0046330 A1 Hayes 3-2003

The admitted prior art, paragraph 09 of the background of the invention

(9) Grounds of Rejection

The following ground(s) of rejection are applicable to the appealed claims:

Claim Rejections - 35 USC § 102

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

2. Claims 1, 4-12, and 14-22 are rejected under 35 U.S.C. 102(b) as being anticipated by Mallory (2002/0034182).

Regarding claim 1, Mallory discloses a method for handling out-of-order frames, comprising: (a) receiving an out-of-order frame via a network subsystem; (b) placing data of the out-of-order frame in a host memory (reorder buffer 120 of figure 4); and (c) managing information relating to one or more holes (gaps) in a receive window (sliding window) (see paragraph 0011 for storing out-of-order frame and paragraphs 0060 and 0141 for holes and window).

Regarding claim 4, Mallory discloses the subsystem does not store one or more missing frames relating to the out-of-order frame (see, for example, figure 10 where bad, duplicate, or too old frames are dropped/not stored).

Regarding claim 5, Mallory discloses network interface card (NIC) in figure 14 and paragraph 0145.

Regarding claims 6-8, Mallory discloses placing the data of the out-of-order frame in the host memory if the out-of-order frame is determined to be inside the receive window and dropping the out-of-order frame if the out-of-order frame is determined not to be inside the receive window (see, for example, paragraphs 0057-0058 and figure 10 where Mallory teaches dropping or storing frames based on the age of the sequence number. Note that the too old sequence number is outside the receive window).

Regarding claims 9 and 10, Mallory discloses storing information (state information) relating to a new hole created by the placement of the data of the out-of-order frame wherein the stored information resides on the network subsystem (see status table 122 in figure 4 and paragraph 0074).

Regarding claim 11, Mallory discloses the managed information resides on the network subsystem (see status table 122 in figure 4).

Regarding claim 12, Mallory discloses updating the window (see paragraph 0140).

Regarding claim 14, Mallory discloses mapping TCP space into host buffer space (see, for example, reorder buffer 120 in figure 4 where received TCP frames are stored (mapped) in the reorder buffer).

Regarding claim 15, Mallory discloses a memory whose memory usage scales with a number of holes in the receive window (see, for example, paragraphs 0059-0040 where Mallory teaches of buffering frames following a hole (gap) in a reorder buffer. Therefore, the memory usage in the reorder buffer must scale with a number of holes).

Regarding claim 16, Mallory discloses a memory whose memory usage does not scale with a number of out-of-order frames received (see, for example, paragraph 0063 where Mallory teaches checking the frame to determine if it is a reminder control frame. If it is, the frame is dropped. The reminder control frame that is an out-of-order frame and is dropped while the out-of-order data frames are stored in the reorder buffer. Therefore, the memory usage does not scale with a number of out-of-order frames received).

Regarding claims 17-22, Mallory discloses a method for handling out-of-order frames, comprising: parsing an out-of-order frame into control information and data information (see, for example, table 1 in page 4 and figures 6, 7, or 8 where the control bit (Ctl) specifies whether the frame is a control information frame or a data information frame); processing at least one of the control information, the data information and context information to determine a buffer location in a host memory in which to place the data information (see paragraph 0011 where out-of-order frames are stored in the buffer); and managing receive window hole information, wherein the receive window hole information comprises TCP receive window hole information (see, for example, slide window in paragraphs 0140-0141).

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 2-3 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mallory in view of Hayes.

Regarding claim 2, Mallory does not specifically disclose the out-of-order frame is received via a TCP offload engine (TOE) of the network subsystem or a TCP-enabled Ethernet controller (TEEC) of the network subsystem. However, the use of TOE or TEEC is well known in the art. Hayes discloses the use of offload engine (see, for example, offloading in the abstract). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the offload engine as taught by Hayes in the system of Mallory in order to support high bandwidth communications.

Regarding claim 3, Mallory does not specifically discloses the memory/buffer is a onboard or off board memory. However, to use an onboard or off board to store frames is a matter of choice. Hayes explicitly discloses storing frames in memory (M) off from network interface card (NIC) (see figure 2). Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to not store on an onboard memory as taught by Hayes in the system of Mallory in order to reduce the size of the onboard memory.

5. Claims 23-29 are rejected under 35 U.S.C. 103(a) as being unpatentable over Mallory in view of Hayes and The admitted prior art (APA) (paragraph 09 of the background of the invention).

Regarding claims 23-29, Mallory discloses a system for handling out-of-order frames comprising a host comprising a host memory (reorder buffer in figure 4); process an out-of-order frame; placing data of the out-of-order frame in the host memory; and manage information relating to one or more holes in a receive window (see paragraph 0011 for storing out-of-order

frame and paragraphs 0060 and 0141 for holes and window). Mallory does not specifically disclose a network subsystem coupled to the host via a host interface wherein the network subsystem performing the processing, placing, and managing steps. However, Hayes teaches of using a network subsystem including an auxiliary processor (NIC of figure 5) to perform processing tasks to reduce processing tasks performed by the host processor (see figure 5; abstract; paragraph 0036) and the APA, paragraph 09, discloses that the conventional offload engines may store out-of-order TCP segments in dedicated buffers attached to the offload engines residing on the NIC or a host memory. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the NIC with an auxiliary processor as taught by Hayes in the system of Mallory in order to reduce processing tasks performed by the host processor and storing the out-of-order frame in a host memory as taught by the APA in the system of Mallory in order to minimize or eliminate a dedicated memory in the NIC to reduce cost of the NIC.

(10) Response to Argument

Regarding claims 1 and 17, the applicant argued that Mallory teaches placing the frame in a reorder buffer, but not a host memory, as recited in claims 1 and 17 and that Mallory does not teach or suggest the receiver buffer (reorder buffer) is, or within, a host memory. The examiner disagrees. The reorder buffer is equivalent to the host memory because both the host memory claimed in claims 1 and 17 and the reorder buffer are used for storing out-of-order frame. In addition, buffer is defined as an area of memory used for storing messages. The applicant also argued that Mallory, paragraphs 0060, 0140, and 0141, does not teach managing information relating to one or more holes in a receive window. The examiner disagrees.

Paragraphs 0060, 0140, and 0141 clearly teach of managing information relating to one or more holes in a receive window. Paragraph 0060 teaches of managing information relating to one or more holes (gap) by stating that “where the next higher layer requires frames in order, or resumes the loss of frames if they are out of order, the LARQ handler should be configured to buffer frames followings a gap for a time in a reorder buffer so that if the receiver can fill the gap with retransmitted frames in time, the frame can be passed to the next layer in sequence order.”. Paragraph 0140 teaches of managing information relating to one or more holes in a receive window by stating that “if a received frame’s sequence number (not a Nack control frame) is new and within a window of MaxRxSaveCountChannel from Receive Sequence Number, the receiver will update its state by advancing the **window** of recent sequence numbers until the received frame’s sequence number is current. If the received frame’s new sequence number was outside of the valid sequence numbers, the sequence number should have been treated as out-of-sequence, and the channel reset function performed so that the new frame will be in-sequence.”. Paragraph 0141 teaches of managing information relating to one or more holes in a receive window by stating that “The Receive Sequence Number is repeatedly incremented by 1 (modulo 256, or other size of the sequence space) until it is equal to the received frame’s sequence number. Each time it is updated, the state of the new current sequence number is initialized as missing and the time when it was first missed is recorded, unless the current number is that of the receive frame and the receive frame was a valid data frame (not a reminder and not errored). If the frame is marked received, it is also saved, possibly temporarily. For each new sequence number, the trailing edge of the sliding **window** of recent sequence numbers also changes.”.

Regarding claim 4, the applicant argued that Mallory does not disclose **not storing** one or more missing frames relating to the out-of-order frame. The examiner disagrees because Mallory clearly discloses in figure 10, steps S5, S9, S10, that bad, duplicate, or too old frames are dropped, not stored as claimed in claim 4.

Regarding claim 6, the applicant argued that Mallory does not disclose placing the data of the out-of-order frame in the host memory if the out-of-order frame is determined to be inside the receive window. The examiner disagrees because Mallory teaches in paragraph 0058 that “if the current frame is not the oldest missing frame, it is stored in the receiver’s reorder buffer.”. Note that determining if a frame is inside the receive window or not is based on the result of determining if the frame is too old as described in paragraph 0058. In this paragraph, too old (outside the window) frame is dropped and the not too old (inside the window) is stored in the receiver’s reorder buffer.

Regarding claim 8, the applicant argued that Mallory does not discloses placing a portion of the data of the out-of-order frame in the host memory, the portion of that data being inside the receive window. The examiner disagrees because Mallory teaches in paragraph 0058 that “if the current frame is not the oldest missing frame, it is stored in the receiver’s reorder buffer.”. Note that determining if a frame is inside the receive window or not is based on the result of determining if the frame is too old as described in paragraph 0058. In this paragraph, too old (outside the window) frame is dropped and the not too old (inside the window) is stored in the receiver’s reorder buffer.

Regarding claims 9 and 10, the applicant argued that Mallory does not disclose storing information relating to a new hole... updating information relating to an existing hole ..., and

deleting information relating to a plugged hole ..., as recited in claims 9-10. The examiner disagrees because claims 9 and 10 claims **one** or more of storing, updating, and deleting. Figure 4 that includes a receiver control logic (106), a reorder buffer (120), and a receive status table (122) at least disclose storing information relating to a new hole created by placement of the out-of-order frame. The control logic controls the storing of out-of-order frame in the reorder buffer and storing of the state of the frames in the status table. The details of the status table are shown in figure 9. For example, Figure 9a includes information such as current sequence number and oldest sequence number. Figure 9c includes information such as miss time and receive time.

Regarding claim 11, the applicant argued that Mallory does not disclose the managed information resides on the network subsystem. The examiner disagrees because Figure 4 that includes a receive control logic, reorder buffer, and status table, is a network subsystem.

Regarding claim 12, the applicant argued that Mallory does not disclose updating the receive window based upon the placement of the data of the out-of-order frame. The examiner disagrees because paragraph 0140 clearly teach updating the receive window.

Regarding claim 14, the applicant argued that Mallory does not disclose TCP (transport control protocol) frames are stored (mapped) in the reorder buffer 120 as suggested by the examiner and that storing and mapping are not the same functions and may not be equated. The examiner disagrees because the reorder buffer in Figure 4 is used for storing frames as described in paragraph 0060. The difference between storing and mapping is that mapping allocates an area in a buffer for storing a frame while storing a frame including allocate an area

in the buffer for storing the frame and store the frame at the allocated area. Therefore, storing a frame at a buffer including mapping the frame into the buffer.

Regarding claims 17-22, the applicant argued that Mallory does not disclose any of the limitations of “parsing an out-of-order frame into control information and data information ... processing at least one of the control information ... and managing receive window hole information related to the out-of-order frame,” as recited by the Applicant in claims 17-22. The examiner disagrees. The response to the argument of managing receive window hole information related to the out-of-order frame is described in previous paragraph. The parsing an out-of-order frame into control information and data information is disclosed in, for example, table 1 on page 4 and Figures 6-8. In table 1, the control bit (Ctl) is 1 when a frame is a standard Ethernet frame and is 0 when the frame is a control frame. The control bit is shown in Fig. 6-8.

Regarding claim 2, the applicant argued that the proposed combination of Mallory and Hayes does not teach “the out-of-order frame is received via a TCP offload engine (TOE) of the network subsystem or a TCP-enabled Ethernet controller (TEEC) of the network subsystem. The examiner disagrees because Figure 4 in Hayes clearly shows frames are received from the network E via TCP offload engine (offload auxiliary processor (AP)) residing on the NIC (network interface card). Note that frames received via the offload engine shown in figure 4 can be any type of frames including data frames, control frames, new frames, retransmitted frames, in-order frames, or out-of-order frames. Note also that the system disclosed by Mallory receives frames including out-of-order frames from the network also via a network interface card (NIC), the NIC used in Mallory can include or exclude the offload engine disclosed by Hayes. In addition, the applicant admitted in paragraph 04 that a network interface card (NIC) including

an offload engine is well known. The function of the claimed offload engine of the network subsystem is merely to connect a computer to the network.

Regarding claims 23-29, the applicant argued that even though Mallory discloses storing out-of-order frames, Mallory does not teach “the network subsystem manages information relating to one or more holes in a receive window” as recited in claims 23-29. Further neither Hayes nor the APA discloses “the network subsystem manages information relating to one or more holes in a receive window” as recited in claims 23-29. The examiner agrees with the applicant that Mallory does not teach the network subsystem manages information relating to one or more holes in a receive window. In fact, the examiner pointed out in the Office action that the host, not the network subsystem as claimed in claim 23, performs the processing of an out-of-order frame, placing the out-of-order frame in the host memory, and managing information relating to one or more holes in a receive window. However, the examiner uses the teaching of Hayes that computationally intensive and memory bandwidth intensive protocol processing tasks are offloaded from the host processor of a computer to an offload auxiliary processor. See abstract and paragraph 0036 where Hayes disclose the benefit of offloading tasks to an offload auxiliary processor. Therefore, it would have been obvious to a person of ordinary skill in the art at the time the invention was made to use the NIC with an offload auxiliary processor to perform the offloaded tasks as taught by Hayes in the system of Mallory in order to reduce tasks performed by the host processor. In addition, the APA clearly discloses the limitation of “the network subsystem manages information relating to one or more holes in a receive window”. See page 4, line 1 of the application where the APA discloses the window size and page 4, lines 7-9 where the APA discloses the network subsystem manages information relating to one or more

holes by stating that conventional offload engine may store out-of-order TCP segments in dedicated buffers attached to the offload engines residing on the NIC or a host memory until all the missing TCP segments have been received.

(11) Related Proceeding(s) Appendix

No decision rendered by a court or the Board is identified by the examiner in the Related Appeals and Interferences section of this examiner's answer.

For the above reasons, it is believed that the rejections should be sustained.

Respectfully submitted,

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